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Morbidity after termination of pregnancy in first trimester

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SUMMARY The outcome of termination of pregnancy was observed in relation to the preoperative clinical and microbiological findings in 167 women attending a day care abortion unit in Liverpool. Before termination, *Chlamydia trachomatis* was isolated from the cervix of 19 (11%) of the patients and high counts (>10^4 colour changing units (ccu) per ml of specimen) of mycoplasmas were found in 30 (18%). Coexistent infections with chlamydiae and high counts of mycoplasmas occurred in only seven (4%) women. *Trichomonas vaginalis,* yeasts, or pathogenic bacteria were found in vaginal swabs from 30 (18%) women.

After undergoing termination, seven (4%) women developed pelvic inflammatory disease (PID), five (71%) of whom had yielded *C trachomatis* before undergoing termination. A further 13 (8%) patients developed minor morbidity of the upper genital tract; high count mycoplasmal infection had been found in seven (54%) and chlamydial infection in three (23%) of these women before termination. In contrast, *C trachomatis* had been isolated from only 11 (8%) and high counts of mycoplasmas from 23 (16%) of the 147 women who had uneventful recoveries after undergoing termination. No correlation was apparent between the presence of vaginal pathogens before termination and the development of untoward sequelae postoperatively. Neither the history nor clinical examination before termination would have indicated that chlamydial or mycoplasmal infections were present, or that postoperative complications were likely to occur. Abnormal cervical cytology, however, was found in 86 (52%) of women overall, including 15 (79%) of the 19 women with chlamydial infection.

Introduction

Termination of pregnancy is often performed on women who intend to have children at a later date. It is thus relevant that pelvic inflammatory disease (PID), which commonly leads to secondary infertility,[1] is itself a recognised complication of first trimester abortion,[2 3 4] and that the incidence of PID is strongly associated with the incidence of sexually transmitted diseases (STD).[5] In particular, PID may follow infection with *Neisseria gonorrhoeae,*[6] *Chlamydia trachomatis,*[7] or genital mycoplasmas[8] even in non-pregnant women.

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In Liverpool in 1984–5, we found chlamydial infections in 1032/6610 (15·6%) unselected non-pregnant women and in 69/429 (16·1%) of pregnant women presenting at our STD clinic. In a previous study in 1983 we had found chlamydial infections in 18/252 (7%) unselected women on their first visit to a conventional antenatal clinic in one of the two maternity hospitals serving the whole Liverpool Health Authority area, where 99·2% of all births in the area occur.[9] It therefore seemed probable that infections would be common in women seeking abortion in the same city. Few investigations of such groups have so far been reported in Britain. Accordingly, we decided to study patients referred by their family doctors to the Bedford day care abortion unit in the Liverpool Women's hospital (funded by Merseyside Regional Hospital Board), which is supervised by a consultant gynaecologist and carries out at least 50 terminations

of pregnancy each week. Patients are interviewed and examined by a medical officer, but there is no routine laboratory screening for genital tract infections. Appropriate patients are asked to return to the clinic, usually within seven days, after fasting overnight. Termination of pregnancy is performed by vacuum aspiration under general anaesthesia, and the patients are allowed to go home on the same afternoon. No follow up visit is arranged.

The purpose of this study was to assess the incidence of PID or other morbidity after termination and to consider whether preoperative screening by clinical and laboratory means could have identified any patients particularly at risk of developing such complications, who would thus have merited special attention before and after the operation.

Patients, materials, and methods

POPULATION STUDIED

The study included 167 patients, over 90% of whom were white Europeans, who attended the clinic between May and December 1984. After giving their written consent they were interviewed and examined by members of the department of genitourinary medicine (GUM), University of Liverpool, immediately before operation. Thus microbiological and serological results were unknown at the time of termination.

CLINICAL AND MICROBIOLOGICAL PROCEDURES

The history was obtained and pelvic examination carried out as described previously.[9] Swabs were taken for culture of herpes viruses from the vulva and cervix, for *N gonorrhoeae* from the urethra and cervix, for *C trachomatis* and genital mycoplasmas from the cervix only, and for *Trichomonas vaginalis,* yeasts, and bacteria from the vagina. The vaginal swabs were examined for bacterial pathogens especially for β haemolytic streptococci, anaerobic streptococci, staphylococci, and *Gardnerella, Clostridia,* and *Bacteroides* species by inoculation on to blood agar plates incubated aerobically and anaerobically. Blood was collected for serological tests for syphilis and the microimmunofluorescence test for antibody to chlamydiae. Smears for cervical cytology had been taken at each patient's first visit. Swabs for the culture of mycoplasmas and ureaplasmas were expressed into A3 × B transport medium, which was inoculated and serially diluted in tenfold steps in Hayflick broth containing either 1% (w/v) arginine for detecting mycoplasmas, or 1% (w/v) urea for detecting ureaplasmas, plus 0·002% (w/v) phenol red indicator.[10] Positive results were expressed as colour changing units (ccu) per ml of original specimen. Details of the techniques for obtaining and testing the various swabs have been described previously.[11]

FOLLOW UP EXAMINATION

Patients found to have had preoperative infection with *C trachomatis* or vaginal pathogens were asked to attend the GUM clinic for treatment. By that time termination had already been performed. The interval between termination and the follow up visit ranged from eight to 17 (mean = 13·5) days. A clinical examination was made, but no further swabs or serum samples were taken. Appropriate treatment for the infection was given. All 19 women with prior chlamydial infection were given contact cards and asked to ensure that their sexual partners attended a GUM clinic.

In the cases of women yielding only mycoplasmas or ureaplasmas or in whom no preoperative infection had been detected, about six weeks after termination enquiries were made of the family doctor by a printed protocol as detailed below.

DIAGNOSTIC CRITERIA

The criteria for evaluation of upper genital tract morbidity were based on those used widely in this type of survey, as described by Sonne-Holm *et al* and detailed below.[12] In women who returned to the hospital, either in response to our follow up request or after being referred by their family doctor, PID was diagnosed in the presence of (1) moderate uterine or parametrial tenderness, (2) tender adnexial masses, (3) increased vaginal discharge or bleeding, or (4) a temperature higher than 38°C. Verification by laparoscopy was not possible or practical. The doctors of women who were seen only by their family doctor, and not referred to the GUM clinic, confirmed that the patients remained free of symptoms, or they completed a printed form that embodied the above specific points of enquiry; when necessary we held further discussion with the doctors to satisfy ourselves which women with any untoward outcome of termination were experiencing an upper genital tract infection. In fact the returns indicated that minor upper genital tract morbidity had been seen and treated by family doctors, and details of such treatment were obtained, but no cases of major infection (PID) were found except in the patients referred (as above) to this hospital.

STATISTICAL ANALYSIS

Statistical evaluation of all results was made by the χ^2 test with Yates's correction for continuity.

Results

THE OUTCOME OF TERMINATION

The 167 women in this study may be most conveniently considered in three groups: group A (147

TABLE I *Social factors in relation to morbidity after termination of pregnancy*

Variable	Outcome of termination: Uneventful (group A) (n = 147)*	PID (group B) (n = 7)	Other morbidity (group C) (n = 13)	Total (%) (n = 167)
Age <20 years	54	4	7	65 (39)
Single, separated, or divorced	114	6	10	130 (78)
Social class V or VI	97	6	10	113 (68)
Four or more sexual partners	18	4	3	25 (15)
Coitus > 3 times/week	54	4	2	60 (36)
Barrier contraception	46	2	3	51 (31)
No contraception	71	5	8	84 (50)
Parity >1	69	3	12	84 (50)
Previous termination	22	2	1	25 (15)
Previous neonatal infection	6	1	0	7 (4)

*Includes three women with retained products of conception.
PID = pelvic inflammatory disease.

women, 88% of participants); recovered uneventfully from the operation (144 patients), but three required treatment for retained products of conception; group B (seven women, 4% of participants) developed PID; and group C (13 women, 8% of participants) had minor morbidity suggestive of upper genital tract infection.

ASSOCIATION BETWEEN OUTCOME OF TERMINATION AND PREOPERATIVE FINDINGS

We found no major differences between group A and groups B and C in their histories or social factors (table I) except for the numbers of their sexual partners; 7/20 (35%) in groups B and C but only 18/147 (12%) in group A had had four or more partners ($\chi^2 = 5{\cdot}5$; $p < 0{\cdot}02 > 0{\cdot}01$). There were no significant differences in numbers using various forms of contraception (such as in those using barrier contraceptives regularly) between group A and groups B and C.

Clinical and laboratory findings are shown in table II. Chlamydial infection of the cervix was found in 19/167 (11%) women, comprising 5/7 (71%) of group B, 3/13 (23%) of group C, but only 11/147 (8%) of group A. These differences between women with post-

TABLE II *Clinical and laboratory findings before termination of pregnancy in relation to postoperative moribidity*

Variable	Outcome of termination: Uneventful (group A) (n = 147)*	PID (group B) (n = 7)	Other morbidity (group C) (n = 13)	Total (%) (n = 167)
Vaginal discharge	60	6	4	70 (42)
Abdominal pain	44	4	8	56 (34)
Urinary symptoms	28	1	1	30 (18)
Cervical ectopy	75	3	5	83 (50)
Cervical mucopus	16	1	1	18 (11)
Abnormal cervical cytology	77	5	4	86 (51)
Chlamydia trachomatis infection	11	5	3	19 (11)
C trachomatis antibody	26	4	4	34 (20)
Mycoplasmas or ureaplasmas (high count infection)	23	0	7	30 (18)
Vaginal infection with:				
Trichomonas vaginalis	4	1	2	7 (4)
Candida species	17	2	2	21 (13)
Gardnerella vaginalis	10	1	0	11 (7)
Bacteroides species	4	0	2	6 (4)
Clostridium species	0	0	0	0
β haemolytic streptococci	3	1	0	4 (2)
Anaerobic streptococci	2	0	1	3 (2)
Staphylococcus aureus	0	0	1	1 (1)
Total with vaginal infection	24	2	4	30 (18)

operative morbidity and those with an uneventful outcome were significant ($\chi^2 = 15{\cdot}4$; $p < 0{\cdot}001$).

Antichlamydial antibody was found in 26/147 (18%) group A patients, comprising 6/11 (55%) of those from whom chlamydiae had been isolated and 20/136 (15%) women with negative chlamydial cultures. In groups B and C antibody was found in 8/20 (40%), comprising 6/8 (75%) women from whom chlamydiae had been isolated and 2/12 (17%) with negative chlamydial cultures. There was no appreciable difference in mean titre between the various groups or between those with or without concurrent isolates of chlamydiae. Infection with *Mycoplasma hominis* was found in 43 (26%) and *Ureaplasma urealyticum* in 108 (65%) of the 167 patients. High counts ($> 10^4$ ccu/ml) of these agents were isolated from only 30 (18%) of patients. Of these high count infections, 23 (76%) were in group A (representing only 16% of that group), whereas seven (23%) were in group C women (representing 54% of the group), a significant difference ($\chi^2 = 9{\cdot}1$; $p < 0{\cdot}01$). No high count isolations were made from group B.

N gonorrhoeae was not isolated from any of the patients, and serological tests for syphilis gave negative results in all 167 women. There were no significant differences between the groups in the incidence of infections with yeasts, trichomonads, gardnerellas, or other bacteria. Abdominal pain was present in 12/20 (60%) women in groups B and C but only in 44/147 (30%) in group A ($\chi^2 = 5{\cdot}9$; $p < 0{\cdot}02 > 0{\cdot}01$). Vaginal discharge was found in 6/7 (86%) of group B patients and in 60/147 (41%) of group A women, but this difference was not significant ($\chi^2 = 3{\cdot}8$; $p = 0{\cdot}05$). Abdominal pain was not related to the microbiological findings, whereas vaginal discharge occurred in 14/19 (74%) of women with chlamydial infections but only in 56/148 (38%) of women without chlamydial isolation ($\chi^2 = 7{\cdot}3$; $p < 0{\cdot}01$). Neither cervical ectopy nor mucopus were important indicators of chlamydial infection in women either with or without postoperative complications.

We considered the possibility that postoperative morbidity might be especially likely to occur in women with a multiplicity of preoperative infections, rather than in those with chlamydial or high count mycoplasmal infections or infections with vaginal pathogens alone. Combined chlamydial and high count mycoplasmal infection, however, was found in only 7/167 (4%) women, none of whom had subsequent morbidity; only one of the seven women with PID and two of the 13 women with minor morbidity had combined infection with chlamydiae and vaginal pathogens.

TREATMENT

All the patients with chlamydial infections were treated on their first postoperative visit to the clinic. In all cases where PID was recorded the signs and symptoms had already developed by the time of this first visit, before treatment, and no further patients developed upper genital tract morbidity after treatment had started. Patients with PID were given oxytetracycline 500 mg orally four times a day for seven days, followed by 250 mg four times a day for a further seven days; women with preoperative chlamydial infection but without postoperative morbidity were given oxytetracycline 250 mg four times a day for 14 days.

CERVICAL SMEARS IN RELATION TO INFECTION

Of smears obtained from the cervix of all 167 women, 86 (51%) showed abnormalities, mainly inflammatory changes; the incidence did not differ appreciably between the three groups, or between those with or without high count mycoplasmal infections. Of the 19 women with chlamydial infection, however, 15 (79%) yielded abnormal smears, whereas only 71/148 (48%) smears from women without chlamydial infection of the cervix showed abnormal cytology. ($\chi^2 = 5{\cdot}3$; $p < 0{\cdot}02 > 0{\cdot}01$).

Discussion

An untoward outcome of termination of pregnancy was found in 20/167 (12%) patients on their first postoperative visit to the clinic or family doctor, before any treatment had been possible. These women were clinically ill, with symptoms and signs of upper genital tract infection requiring urgent chemotherapy. The nature of their illness strongly suggested major infection of the uterine tubes (PID) in seven (group B) of the 28 women seen early in the gynaecology and genitourinary clinics of this hospital. Of the 139 women seen later by their family doctors, 13 showed clinical signs and symptoms (mainly severe abdominal pain, excessive vaginal discharge, and pyrexia) that suggested minor upper genital tract infection. It is unlikely that frank major PID was missed in any of these women seen by their family doctors, but the later development of salpingitis would seem to have been likely if they had not been treated and followed up. A single episode of PID may result in tubal dysfunction, and persistent or recurrent infections, which may cause no subjective symptoms, can rapidly impair tubal patency.[13] Thus the future fertility of some, if not all, of these 20 patients could have been compromised. Only 16/167 (10%) women failed to attend follow up, and we assumed that they remained asymptomatic.

Neither the history nor the clinical examination would have identified which women would develop postoperative morbidity, nor indeed which women had preoperative genital tract infections, either with or

without subsequent complications. Contact with four or more sexual partners was more common in women with morbidity than in those with a normal outcome, which probably explains their higher incidence of sexually transmitted infection. There were, however, no other apparent differences in sexual behaviour, use of barrier contraceptives, previous pregnancies, or events in previous pregnancies. Vaginal discharge and abdominal pain were more prevalent in women in groups B and C, but these symptoms are so vague and so common in early pregnancy that they are of little predictive value.

In contrast, preoperative microbiological tests would clearly have indicated those at risk, as 5/7 (71%) of those with subsequent PID yielded *C trachomatis* from cervical swabs, whereas positive swabs were found only in 11/147 (8%) women with an uneventful postoperative outcome. Similarly, 7/13 (54%) group B women with minor upper genital tract morbidity had yielded high counts of genital mycoplasmas, whereas this degree of infection had been found in only 23/147 (16%) women with normal outcome.

C trachomatis infections are widely present in sexually active women attending not only STD clinics, but also family planning clinics, gynaecology clinics, and routine antenatal clinics in Europe and America[15] and attending general practice.[16] The overall incidence of chlamydial infections in the present study (19/167; 11%) is thus not surprising and is similar to that reported previously in abortion clinics in Norway[3] and in the USA.[17] In the present study, as in many previous investigations, chlamydial isolations often came from women with no signs of cervical inflammation, and conversely signs of cervical inflammation were found in women whose swabs did not yield chlamydiae. Laboratory proof of chlamydial infection was thus essential. Serological tests were not an acceptable substitute for isolation of the agent, as they detected only 12/19 (63%) women with positive chlamydial cultures, but showed results at similar titres in 22/148 (15%) women with no cultural evidence of current infection. We had expected that the overall incidence of infection with genital mycoplasmas would be high, as in other studies.[16] Patients with positive cultures were therefore not recalled for follow up in the Liverpool Women's Hospital. Subsequent evaluation, however, showed that an appreciable number of the patients who later sought advice from their family doctor, and who were diagnosed as having genital tract morbidity, had preoperatively had high count infections with mycoplasmas. The illness in these patients was milder and of later onset than that in women with chlamydial infections. This may have been because chlamydial infection ascends by the canicular route to cause endosalpingitis,[18] whereas the spread of mycoplasmas to the upper genital tract is via the lymphatics or bloodstream after breaches in the epithelium, resulting in exosalpingitis.[19]

With genital tract infections and their sequelae in mind, the use of routine chemoprophylaxis has often been recommended in abortion clinics,[21 22] but in fact is not often practised in Britain. Currently recommended routine schedules, however, even for established PID, often consist only of penicillin and metronidazole,[20] neither of which would be active against chlamydiae or mycoplasmas. Even if the more appropriate antibiotics, tetracycline or erythromycin, were given it would not be advisable to use them in circumstances where neither the presence of the disease, nor proof of its cure could be firmly established, in other words without laboratory control. Furthermore, unless chlamydial infections are accurately diagnosed imperfect treatment may be given, which merely suppresses the infection and leaves a likelihood of recrudescence, or leaves the woman exposed to reinfection from her sexual partner, who is also presumably infected, but who would not have been contacted, diagnosed, or treated.

Gonorrhoea was not diagnosed in any of the patients in this study, and in fact there were fewer genital tract infections of any type in patients undergoing termination than in patients attending our STD clinic in the same district. This may be associated with differences in degrees of sexual activity and in contraceptive practices; condoms were used by the partners of 31% of patients undergoing termination but of only 8% of patients attending STD clinics, whereas only 15% of patients undergoing termination had used oral contraceptives in contrast with 43% of patients attending STD clinics.

The incidence of inflammatory changes in Ayre's smears from patients in the present study was four times greater than in conventional antenatal clinics in Liverpool (McDicken, personal communication). Many of these inflammatory changes related to chlamydial infection and returned to normal after chemotherapy, as observed in other trials,[23 24] but other cytological abnormalities persisted and required further gynaecological investigation and treatment, which confirmed the value of the cytological screening already carried out in this clinic.

Our findings suggest that untoward sequelae of legal abortion are a common result of genital tract infections already present when the patient was first referred to the abortion clinic. These infections can be diagnosed in the laboratory easily and relatively quickly; and routine screening for their presence could readily permit appropriate treatment and surveillance of patients and their sexual contacts. This should not only reduce the incidence of such infections in the sexually

active community, but should also avoid the complications ensuing from them.

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